

**Clean Copy of All Pending Claims**

1. (Amended) A method of processing a silicon substrate, comprising:

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evacuating a vacuum chamber in which the substrate is placed to a first pressure;  
introducing a fluid other than molecular oxygen into the vacuum chamber; and  
implanting ions into the substrate to form a buried oxide layer under a top silicon layer,  
wherein the fluid inhibits formations of threading dislocations in the top silicon layer for  
reducing a defect density of the processed substrate.

2. The method according to claim 1, further including selecting the fluid from the group  
consisting of water vapor, heavy water, air, argon, and hydrogen gases.

3. The method according to claim 1, wherein the fluid is a hydrogen-containing fluid.

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4. The method according to claim 1, wherein the fluid is a reducing agent.

5. The method according to claim 1, wherein the fluid is a surface oxide inhibiting agent.

6. The method according to claim 1, wherein the first pressure is less than about  $1 \times 10^{-5}$   
Torr.

7. The method according to claim 1, wherein introducing the fluid into the vacuum chamber  
produces a second pressure in the vacuum chamber that is less than about  $1 \times 10^{-3}$  Torr.

8. The method according to claim 1, further including actively controlling the amount of  
fluid introduced into the vacuum chamber based upon a parameter measured in the chamber.

9. The method according to claim 8, further including selecting the parameter from the group consisting of pressure, water vapor/ion concentration, and temperature.
10. The method according to claim 8, wherein the parameter includes a measurement of an ion beam current.
11. The method according to claim 10, wherein the measurement includes a measurement of a decrease in the beam current due to the fluid in the chamber.
12. (Amended) A method of processing a substrate, comprising:
- evacuating a vacuum chamber in which the substrate is placed to a first pressure;
  - introducing a fluid into the vacuum chamber;
  - implanting ions into the substrate using an ion beam to form a buried oxide layer under a top silicon layer;
  - measuring a decrease in the ion beam current level due to the fluid in the chamber;
  - and
  - adjusting the fluid level based upon the measured ion beam current level.
13. The method according to claim 12, further including the step of selecting the fluid from fluids that inhibit formations of threading dislocations in the top silicon layer for reducing a defect density of the processed substrate.

14. (New) A system for producing SIMOX wafers, comprising
- an ion source for generating ions,
  - a vacuum chamber coupled to the ion source for receiving the ions,
  - a vacuum pump coupled to the vacuum chamber for maintaining the chamber at a selected pressure,
  - a fluid valve coupled to the vacuum chamber and a source of fluid for introducing the fluid from the source to the chamber,
  - a wafer holder for holding the wafers in the vacuum chamber in a path of the ions,

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a feedback control system coupled to the vacuum chamber and the fluid valve for adjusting the valve to regulate flow of the fluid into the chamber based on one or more parameters measured in the chamber.

15. (New) The system of claim 14, further comprising a transducer coupled to the vacuum chamber and the feedback system for measuring at least one of said parameters in the chamber and transmitting the measured parameter to the feedback system.

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16. (New) The system of claim 15, wherein the transducer measures any of pressure, temperature, ion current, and fluid concentration in said chamber.

17. (New) The system of claim 16, wherein the feedback system adjusts the fluid valve to control the flow of fluid into the chamber based on measured ion current in the chamber.

18. (New) The system of claim 17, wherein the feedback system adjusts the fluid valve to decrease fluid flow into the chamber when the measured ion current is less than a selected value.

19. (New) The system of claim 17, wherein the feedback system adjusts the fluid valve to increase fluid flow into the chamber when the measured ion current is greater than a selected value.